meap

Michigan Educational Assessment Program

Lens Investigation
Teacher Guide

Grade 8

Winter 2000

Lens Investigation
Grade 8

Teacher Instructions

One part of the MEAP science test consists of a set of questions about an investigation the students conduct in advance. These are the teacher instructions for this year's investigation. This investigation is intended to demonstrate how changing the shape of a lens will affect the size of the image seen. Students will present their findings in writing and chart format to answer the following question:

How does the shape of a lens affect the size of the image seen?

Each teacher will be provided with a **Teacher Guide,** sufficient copies of the **Lens Investigation Report Form** for each student, and the necessary materials to conduct the investigation.

Procedure:

Step 1

Review this document to help you prepare for classroom discussion. Prior to the investigation, lead a class discussion about how different types of lenses refract light.

Step 2: Materials

Collect the necessary materials and practice the investigation yourself to become familiar with the materials and procedure. Display the materials where the students will have easy access to them. (Materials should be allocated as a set for each group to save time during the investigation.)

Provided by MEAP (for each group of 4 students)

1 metal washer
1 container of petroleum jelly
2 small plastic cups
1 clear microscope slide
1 eye dropper
Lens Investigation Report Forms (1 for each student)

Provided by the local district to each group

tap water
printed page (e.g. newsprint)

Step 3

Organize the class into investigation groups of 3 to 4 students.

Step 4

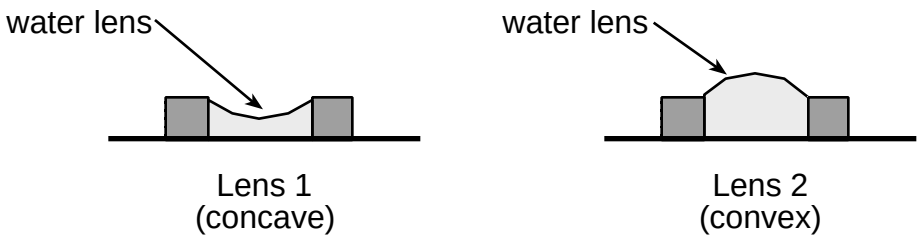
Pass out a Lens Investigation Report Form to each student. Impress upon the students the importance of having a complete report form to use as a reference when they take the MEAP science test.

Step 5

Present the question being investigated.

Say: The purpose of this investigation is to answer the question: **How does the shape of a lens affect the size of the image seen?**

Demonstrate making lenses of different shapes (concave and convex).



Step 6

Direct students to complete the *Hypothesis* section on page 3 of their Lens Investigation Report Form.

Step 7

Review the materials to be used by each student group. Indicate the part that each material will have in the investigation:

1. metal washer – holds the water lens inside
2. petroleum jelly – seals washer to microscope slide
3. 2 small plastic cups – use a cup to support each end of the slide above the newspaper page
4. clear microscope slide – holds lens
5. eye dropper – places water in washer
6. Lens Investigation Report Form - one for each student
7. tap water – the lens material
8. printed page (e.g. newsprint) – image viewed through lens

Step 8

Have each group plan and write down the procedure it will follow.

Teacher Instructions to students: "Each small group will plan its procedure for conducting the investigation, using the materials just described. I will not help you plan your procedure, but I will check to see that you have it written down in your Lens Investigation Report Form. Set up a chart for recording your *Observations/Data* on your Lens Investigation Report Form on page 4. You should carry out your procedure at least three times and record the results for each trial."

Ask the students if they have any general questions about the investigation.

Step 9

Have each group proceed with the investigation and have every student record the results in his/her report form.

Step 10

Have each group discuss its *Evidence* and *Conclusion* with the class.

Step 11

Have each student complete his/her Lens Investigation Report Form and hand it in to the teacher. The report forms should be stored in a safe place and returned to the students just before they take the MEAP science test.

Sample Student Responses To

Lens Investigation

Grade 8

This teacher's information is supplied by MEAP as a reference guide for the Lens Investigation Report Form. The sample answers provided may not necessarily reflect your students' work.

MEGOSE objective(s): C-8 R-6 PWV-9[1]

Question:

How does the shape of a lens affect the size of the image seen?

Previous Knowledge:

Seeing an object depends on how our eyes received light from the object. Having the light, reflected from the object, pass through a lens placed between the object and our eyes affects the appearance of the object.

A concave lens is thin in the middle compared to its edge.
A convex lens is thick in the middle compared to its edge.

Hypothesis:

A lens that is thin in the middle (concave) will make objects look smaller and a lens that is thicker in the middle (convex) will make objects look larger. Lenses are used to change the size of an image.

Materials:

1. metal washer
2. petroleum jelly
3. 2 small plastic cups
4. microscope slide
5. eye dropper
6. Lens Investigation Report Form (for <u>each</u> student)
7. tap water
8. printed page (e.g. newsprint)

[1]These MEGOSE objectives directly correspond to following Science standard and content benchmarks from the Michigan Science Curriculum Framework: Middle School I 1.2, II 1.1 and IV 4.4.

Procedure:

1. Turn the 2 small plastic cups upside down on the newspaper page. Bridge the slide across the 2 cups, about 1cm of the narrow end of the slide overlaps each cup. Spread a thin layer of petroleum jelly on the bottom of the washer and place the washer (jelly side down) on the center of the slide between the 2 cups.

2. Observe the newsprint on the newspaper page through the hole in the center of the washer and record observations.

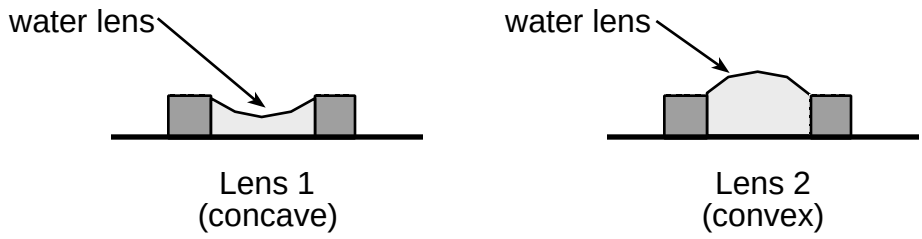
3. Add 2 or 3 drops of water to the hole in the center of the washer and spread the water around inside the hole. This produces a concave lens.

4. Observe the newsprint through the hole in the center of the washer and record observations.

5. Add 2 or 3 more drops of water to the center of the washer so that the water heaps higher than the washer. This produces a convex lens.

6. Observe the newsprint through the hole in the center of the washer and record observations.

Observations/Data/Evidence (charts, graphs, tables)**:**



Type of Lens	Appearance of Print
No lens	Actual size
Lens 1	Smaller
Lens 2	Larger

Conclusion (include reasons for your conclusion)**:**

Changing the shape of the lens affected the size of the image seen. The first lens created (concave lens) caused the newspaper print to appear smaller. By adding more water the second lens (convex lens) was created. This lens caused the newspaper print to appear larger.

Reasons for Error:

Petroleum jelly between water lens and slide, possibly causing distortion in the view.
Insufficient water seal, water was leaking out of the seal.